South King County Ground Water Management Plan
EXECUTIVE SUMMARY

SETTING

The South King County Ground Water Management Plan documents the work of local governments and citizens to understand and protect the ground waters underlying south King County. Within the Planning area, ground water is the major source of potable water for residents.

Most of the work done to produce this document was completed between 1990 and 1995. Since that time several events have occurred that have changed the setting in the study area. These include:

- Implementation of the Washington State Growth Management Act that required local governments to identify and protect sensitive areas and natural resources, and
- Implementation of Wellhead Protection Programs that require water utilities to identify recharge areas and water quality risks for each groundwater well in use, and
- King County has passed a ground water management ordinance and implemented a modest ground water management program.

As a result, many of the actions included in this plan have been accomplished under other programs. The Plan and process described in this Ground Water Management Plan has not been redrafted to reflect changes since 1995.

In several locations were it was deemed to be particularly helpful, an editorial update has been include. Each of these appears in a box to assist the reader.

BACKGROUND

The South King County Ground Water Management Area encompasses approximately 260 square miles in southwest King County. It is bounded on the north by the Duwamish and Cedar Rivers, on the east by the Black Diamond area, on the south by the Green River and Pierce County and on the west by Puget Sound. See Figure 1. The management area is urban in the central and western portions, suburban/rural in the eastern area and primarily commercial in the central and lower Green River Valley.

The South King County Ground Water Advisory Committee (GWAC) developed the South King County Ground Water Management Plan to meet this area's ground water protection needs. The goal is to protect the quality and quantity of area ground water, now and in the future, and to provide effective and coordinated resource management. This area's population is projected to increase, which may well affect ground water status. A comprehensive plan, tailored to the specific needs of the region, is needed to protect the supply of this essential resource.

The goal of the ground water management plan is to promote an appreciation for the complexity of the ground water system, to describe potential threats to the system, and to identify strategies which can contribute to the long-term management and beneficial use of ground water resources.

The Ground Water Advisory Committee has developed a ground water management plan that includes:

- An area characterization report
- Identification and description of threats to ground water
- Recommended strategies that remedy or reduce these threats, and
- An implementation process
- Public involvement through the Ground Water Advisory Committee

Reliance on Ground Water

Ground water is the primary source of municipal and potable water used in the South King County Ground Water Management Area (GWMA). This includes water for private and municipal water needs, as well as industrial and agricultural needs. This comprehensive plan was developed to help avoid ground water contamination and ensure continuing availability, for once a source of ground water is contaminated, it may be lost forever. Protecting ground water from contamination is considerably less expensive than paying for cleanup. Ensuring water resource availability is crucial to continued growth. The status and extent of our ground water resource must be determined first before planning for wise use and effective management.

Plan Development

This Ground Water Management Plan represents a community consensus on the most practical protection approach and measures, and encourages local and state agencies to develop ground water regulations and programs.

The Ground Water Management Plan is based in state law. In 1985, the state legislature recognized the need for greater ground water protection by adopting legislation which directed the Washington State Department of Ecology (Ecology) to establish a process for designating and developing plans for ground water management areas. (Chapter 90.44 RCW)

The GWMA was designated a Ground Water Management Area by Ecology on October 7, 1986. In accordance with guidelines in Chapter 173-100 WAC, Ecology approved the membership of the South King County Ground Water Area Ground Water Advisory Committee, consisting of representatives from many groups with broad cross section of interests. The South King County Regional Water Association (RWA) applied to the Department of Ecology for funds to conduct the ground water study. The RWA and the Seattle-King County Health Department were designated co-lead agencies by the Department of Ecology. The Seattle-King County Health Department was selected to be the co-lead agency because it has jurisdiction throughout the Ground Water Management Area, as well as a regulatory role in water systems, on-site sewage systems, solid and hazardous waste, and general environmental health concerns.

On January 1, 1996, the King County Department of Natural Resources and Parks, Water and Land Resources Division, assumed the role of co-lead agency for this study from the Seattle King County Health Department.

Land Use Impacts on Ground Water

Land use can have a significant impact on ground water quality and use. As area population grows, consumptive use of ground water will increase. In addition, as development increases, the risk of contamination of ground

water resources is likely to increase. Ground water reserves can also be depleted by development covering recharge areas with impermeable surfaces that reduce aquifer recharge.

Forecasts prepared by the Puget Sound Regional Council predict that the GWMA will experience a significant increase in population during the next 30 years. Along with the increased population, employment opportunities in the GWMA will expand significantly as well. These two factors will have a major impact on area land uses, including an increase in residential housing, roadway expansion, and commercial and industrial growth. Figure 2 depicts the areas of aquifer susceptibility to ground water contamination in the GWMA.

Geology and Hydrogeology

Ground water infiltration, movement, and storage are controlled by both surface and subsurface geology. Surface infiltration depends on sediment permeability and the accessibility of those sediments to precipitation.

Direct precipitation accounts for most ground water in the GWMA. Precipitation either runs off to surface water, evaporates, is transpired by vegetation, or infiltrates into the soil where it reaches ground water. When ground water can move freely through subsurface deposits, it becomes accessible for use or discharges to surface water bodies. In this study area, the most common aquifers are formed by various outwash deposits of the last glaciation.

Water Quality

Historical ground water quality was complied from data gathered from the Washington State Department of Ecology, the Seattle/King County Health Department (SKCHD) and the United States Geological Survey (USGS). Results of known contamination sites were not included in the statistical-trend analysis so that background results would not be skewed and regional trends in water quality could be evaluated. In general, no significant trends in any of the parameters measured were found. Very few parameters were measured at levels that exceeded maximum contaminant levels, with the exception of naturally occurring iron and manganese.

Water quality monitoring was conducted in 1990 and 1991. It appears that water quality has not been greatly impacted by industrial, residential or agricultural activities where the samples were collected.

Very few samples contained contaminant levels in excess of maximum contaminant levels, as determined under the Safe Drinking Water Act. Semi-volatile organics, pesticides and polychlorinated biphenyls were not detected at any of the sampling sites. Overall, water quality in each of the tested aquifers, appears to be relatively free of inorganic, microbiological and organic contamination.

Water Use

Area ground water is used primarily for domestic and public water supply, industrial use, fire suppression, and providing base flow to streams and lakes.

There are many major public water systems (Group A) in the study area. These include the cities of Algona, Auburn, Black Diamond, Kent, Pacific, Renton, Seattle, and Tukwila; and the special purpose/water districts of Cedar River, Covington, Highline, Lakehaven, Soos Creek and King County Water Districts 20, 49, 111 and 125. In addition there are about 300 Group B public water systems in the GWMA serving two to nine household connections.

Purveyors need to prepare for future growth and development within the area by planning, identifying, financing, and developing new water sources.

Types of Ground Water Contamination

Three types of contaminants found in ground water threaten public health: microbial pathogens, inorganic chemicals and organic chemicals.

Microbial pathogens include bacteria, viruses and other disease-causing organisms. Improperly maintained sewage disposal systems, poorly constructed wells, leaking sewers and animal wastes are common ground water sources of microbial pathogens.

Inorganic chemicals include sodium, chloride, nitrate and heavy metals. Nitrate occurs naturally, and as a result of human activities such as septic systems, fertilizer use, and contaminated storm water runoff. Nitrate is an important ground water-quality indicator, because it is associated with other pollutants. Metals also may be naturally occurring, or come from human activities such as commercial and industrial land uses, or from stormwater runoff from streets and parking lots. Many metals are known to be harmful to health, including copper, zinc, lead, arsenic and cadmium. Iron and manganese are common in
ground water in King County. They do not pose a health threat, but may occasionally affect the taste of the water and may cause staining. Organic chemicals include oil, gasoline, de-greasers, solvents and some pesticides. Organic chemicals come from the improper use, storage or disposal of fuels, solvents, pesticides and herbicides. Organic chemicals may persist in ground water for decades, and are known to cause cancer and contribute to a variety of illnesses.

Potential Sources of Contamination

Contaminants come from a wide variety of sources. Specific potential contamination sources that the Plan covers include: hazardous materials, underground storage tanks, on-site sewage disposal systems, pesticides and fertilizers, well construction and decommission methods, sewers, solid waste landfills, burial of human remains, sand and gravel mining, and land application of biosolids and effluent.

MANAGEMENT STRATEGIES

The GWAC adopted the following ground water management recommendations, based on careful study and deliberation about possible, effective protection measures. The recommended programs either influence or relate to ground water quality and/or quantity. Table ES-1 outlines the numerous Management Strategies that are presented in Chapter 2 of the South King County Ground Water Management Plan. Each Management strategy is comprised of goals, issues, discussions and tasks.

TABLE ES-1 Management Strategies as Presented by Goals

PROGRAMS RELATED TO GROUND WATER QUALITY & QUANTITY	
	Goal: Special Area Designations to Enhance Ground Water Protection
	SA-1A Elimination of Categorical Exemptions to SEPA
	SA-1B Designation of Environmentally Sensitive Areas
	SA-1C Adoption of General Aquifer Protection Policies
	SA-1D Enhanced Environmental Review to Protect Aquifers
	SA-1E Definition of Ground Water Concern Areas
	SA-2 Wellhead Protection
	Goal: Developing and Implementing Data Collection and Management Program
	DCM-1 Data Collection, Analysis and Management – King County, Cities and Water Purveyors

		DCM-2 Data Collection, Analysis and Management – Transfers to Ecology
	Goal: Promote Stormwater Management Practices	
		ST-1 Runoff versus Recharge
		ST-2A Ground Water Quality Concerns – Zoning
		ST-2B Ground Water Quality Concerns – Facility Requirements
		ST-2C Ground Water Quality Concerns – Study
		ST-3A Education - Review
PROGRAMS RELATED TO GROUND WATER QUALITY & QUANTITY cont.		
		ST-3B Education - Reporting
		ST-3C Education - Developing Program
		ST-3D Education - Coordinate Program
		ST-4A Coordination Between Surface and Ground Water Planning Efforts: Ecology Program
		ST-4B Coordination Between Surface and Ground Water Planning Efforts: Puget Sound Water Quality Authority
		ST-4C Coordination Between Surface and Ground Water Planning Efforts: King County
		ST-5 Assessment of Existing Storm Water Facilities
		ST-6 Roadway Runoff
		ST-7 Soil Amendment
	Goal: Educating Agencies, Jurisdictions, Businesses and Citizens about Ground Water	
		ED-1 Existing Education
		EC-2 New Educational Elements
PROGRAMS (RELATED) TO PROTECT GROUND WATER QUALITY		
	Goal: Hazardous Waste Management	
		HM-1 State Hazardous Waste Plan – Implementation
		HM-2 Dangerous Waste Management Unit
	Goal: Hazardous Waste Contamination Sites	
		HM-4 Hazardous Waste Contamination Sites – Site Referral and Public Education
	Goal: Hazardous Materials Spills	
		HM-5 Implementation of the Uniform Fire Code
		HM-6 Implementation of the Emergency Planning and Community Right-to-Know Act
		HM-7A Transportation – Related Hazardous Materials Spills – Purveyor Assessment
		HM-7B Transportation – Related Hazardous Material Spills – Management Committee Evaluation
	Goal: Ensure Underground Chemical and Fuel Storage Tanks and Piping Systems are Managed	
		UST-1A Augment State Underground Storage Tank Program - Inspection
		UST-1B Augment State Underground Storage Tank Program – Ordinance
		UST-2A Exempt Tanks – Secondary Containment
		UST-2B Exempt Tanks – Testing
		UST-3A Heating Oil Tanks: Abandonment and Maintenance
		UST-3B Heating Oil Tanks: Location
		UST-3C Heating Oil Tanks: Education
	Goal: To Promote On-site Sewage Treatment and Disposal Practices	
		OS-1 Nitrate Concerns
		OS-2A Hazardous Materials: Inventory, Educate and Monitor
		OS-2B Hazardous Material: Regulations
		OS-3A Household Hazardous Waste: Onsite Disposal Risks
		OS-3B Household Hazardous Waste: Educational Program
		OS-4 Operation and Maintenance
PROGRAMS (RELATED) TO PROTECT GROUND WATER QUALITY cont.		
	Goal: Prevent Ground Water Contamination from Use of Pesticides and Fertilizer	
		PF-1A Pesticide and Fertilizer Use: Farm Plans

		PF-1B Pesticide and Fertilizer Use: Pesticide Reduction Program
		PF-1C Pesticide and Fertilizer Use: Vegetation Maintenance Practices
		PF-2A Education and Proposed Programs: Strategy
		PF-2B Education and Proposed Programs: Review
	Goal: Protect Quality of Ground Water in the GWMA by Ensuring Proper Well Construction and Decommissioning	
		WC-1 State Program
		WC-2A Well Identification: Disclosure
		WC-2B Well Identification: Permits
		WC-3A Decommissioning Cost: Funding Mechanism
		WC-3B Decommissioning Cost: Alternate Procedures
		WC-4 Education
	Goal: Prevent Degradation of Ground Water caused by Waste Water	
		SP-1A Sewer Programs
		SP-1B Leakproof Piping
		SP-2 Ground Water Depletion – Backfill
	Goal: Prevent Occurrence of Ground Water Contamination Associated with Solid Waste Disposal Facilities	
		SW-1 Standards
		SW-2 Abandoned Sites
		SW-3 Education
	Goal: Ensure Regulatory Programs are Adequate to Prevent Adverse effects from Sand and Gravel Mining Operations	
		SG-1 Regulatory Modifications
		SG-2A Ground Water Protection
		SG-2B Aquifer Impacts and Regulation
		SG-3A Reclaimed Sand and Gravel Mines
		SG-3B Zoning Code – Reclamation Plans
	Goal: Provided Assurance that Ground Water will not be Contaminated by Reuse of Wastewater Effluent	
		BSE-1 Guideline Revision
PROGRAMS RELATED TO GROUND WATER QUANTITY		
	Goal: Manage Ground Water Resources to Optimize Availability of Ground Water	
		WQ-1 Policies and Ordinances
		WQ-2A Data Needs
		WQ-2B Policies and Ordinances
		WQ-3 Water Rights
		WQ-4A Conservation: Landscaping
		WQ-4B Conservation: Group B Systems
		WQ-5A Education: Low Water-Use Plants
		WQ-5B Education: Schools and General Public
		WQ-5C Education: Aquifer Recharge
		WQ-5D Education: Individual Systems
		WQ-6 Artificial Recharge

PROGRAMS RELATED TO GROUND WATER QUALITY AND QUANTITY

Special Area Designations to Enhance Ground Water Protection

A Ground Water Management Program may be enhanced by any number of special federal state, and area designations by providing a funding source to implement ground water protection measures, enhancing eligibility for grant funds, or expanding review of development proposals.

The Ground Water Advisory Committee Goal is to: *Use available special area designations together with local regulations and policies to enhance ground water protection efforts in the GWMA.*

The proposed management strategies are:

- Designate the GWMA as an Environmentally Sensitive Area so that categorical exemptions, as determined

under SA-1A, may be eliminated (SA-1B)

- King County, cities and special-purpose districts will jointly determine whether any categorical exemptions to SEPA should be eliminated, especially in physically susceptible and recharge areas. (SA-1A)

- Provide guidance to SEPA document reviewers, so they can 1.) identify proposed development that may significantly impact ground water, 2.) recognized and require adequate information to assess impacts upon ground water; and 3.) recognize and propose effective mitigation. (SA-1D)

- King County, cities, and special-purpose districts should adopt general aquifer protection policies, and place a priority on implementation of the proposed Management Plan Strategies in physically susceptible areas and recharge areas, including land use designation and wellhead protection- area policies. (SA - 1C, 2; SA – 1D; SA-1E)

Data Collection and Management Program

Managing the ground water resource and continuing to develop a conceptual characterization of ground water hydrology within the area, requires long-term data collection on ground water quality and quantity, precipitation and stream flow.

The Ground Water Advisory Committee Goal is to: *Protect ground water quantity and quality by developing and implementing a data collection and management program*.

The proposed management strategies include developing and implementing a data collection and management program that collects needed data, enters the data into the ground water management program database, and analyzes the data to provide useful information to decision makers (DCM- 1); and for Ecology to input the local ground water data into its database. (DCM-2)

Storm Water Management

The most serious public health concern about storm water recharge is the possible effects on the quality of ground water used as a source of drinking water. Storm water management practices, past and present, often cause ground water quantity and quality problems.

The Ground Water Advisory Committee goal is to: *Promote storm water management practices that provide the greatest amount of recharge while protecting ground water quality*.

The proposed management strategies are:

- Preserve recharge by requiring that rural zoning, residential zoning, and open space in the most physically susceptible and recharge areas be maintained (ST - 2A).

- Preserve ground water quality by requiring that runoff be infiltrated when site conditions permit. (ST - 1)

- Require all types of storm water facilities to use best management practices as outlined in Ecology's approved design manuals. (ST - 2B, 2C)

Ground Water Education Program

A comprehensive ground water education program is needed to:

- Help engender understanding and concern in order to protect the resource.
- Aid in developing resource protection messages that are consistent regardless of the specific education program.
- Coordinate with other resource protection programs that focus on a specific issue, such as solid waste, hazardous waste or storm water management
- Develop specific education activities and materials for point and non-point sources of contamination.

The Ground Water Advisory Committee goal is to: *Increase individual participation in protecting ground water resources by educating agencies, jurisdictions, and businesses in the threats to ground water quantity and quality, and ways they can reduce those threats*.

The proposed management strategy is to develop and implement an education program that builds upon existing education efforts in the county and adds specific elements as identified in the various management programs. (ED - 1, 2)

PROGRAMS TO PROTECT GROUND WATER QUALITY

Hazardous Materials Management

Ground water contamination can occur when hazardous materials migrate through the soil, or when hazardous materials are spilled into surface water that is connected to ground water. Human health threats occur when contaminated ground water reaches aquifers used for drinking water supplies. Cleaning up contaminated aquifers is difficult, costly, time-consuming, and potentially unsuccessful.

The Ground Water Advisory Committee Goal is to: *Ensure that ground water is not contaminated due to improper management of hazardous substances.*

The proposed management strategies are:

- Support current plans such as the Washington State Hazardous Waste Plan, and to request that Ecology and the Washington Legislature fund and carry out the provisions of the Plan. (BA4-1)
- Enhance existing regulations (for example):

o Ecology may amend the Dangerous Waste Regulations (Chapter 173-303 WAC) to require setbacks from the seasonal high ground water level. (HM-2)

o King County and cities within the Ground Water Management Area should implement through education and regulation, Uniform Fire Code Article 80 in both new and existing facilities. (HM-5)

- King County and cities should seek a permanent source of funding to provide necessary staff and resources to complete a comprehensive Local Emergency Management Plan. (FM-6)

- Provide for future protection of larger Public Water Systems' wellhead protection areas by assessing the risk of transportation related hazardous material spills (HM -7A)

Underground Storage Tank Management

Commercial underground petroleum and chemical storage tanks represent a significant potential threat to ground water quality in King County. Leakage from underground storage tanks and associated piping often occurs without detection and some volatile organic compounds can rapidly migrate through the soil to ground water and have serious adverse affects. Leaking underground home heating oil tanks may also present a threat to ground water quality. Both federal and state agencies adopt a less aggressive approach to regulation of heating oil tanks.

The Ground Water Advisory Committee Goal is to: *Ensure that underground chemical and fuel storage tanks and piping systems are managed/regulated to prevent contamination of ground water.*

The proposed management strategies are:

- Enhance existing regulations:

  - King County and cities should enhance current inspections of underground storage tank Installation and removal in these Environmentally Sensitive Areas to include the relevant requirements of Chapter 173-360 WAC - Underground Storage Tank Regulations. (UST-IA, IB)

- The King County Department of Natural Resources will prepare an ordinance for the King County Council's consideration requiring:

  - Secondary containment for underground storage tanks as defined by Chapter 173-360-120 WAC, and for the following exempt or deferred tanks, heating oil tanks of all sizes and motor fuel tanks of 1100 gallons or less;

  - Disclosure at the time of sale of any property in King County of the number, location, and legal status of existing underground storage tanks; proof from the Fire Marshall or fire chief that the underground home heating oil tank was abandoned in accordance with regulations prior to release of any permits associated with energy conversions (gas piping, electrical, etc.);

  - Proof from the Fire Marshall or fire chief that the underground home heating oil tank was abandoned in accordance with regulations prior to release of any permits associated with energy conversions (gas piping, electrical, etc.);

  - Require all underground storage tanks without secondary containment to be tested at regular intervals for integrity (UST-1B, UST-2A, UST-2B, UST-3A).

- Provide education.

    - King County and cities should jointly educate homeowners and exempt tank owners regarding tank abandonment requirements of the Uniform Fire Code through the Ground Water Management Plan Education Program. (UST-3C)

On-site Sewage Treatment and Disposal System Use

If on-site sewage systems are improperly designed or constructed, installed in inadequate soils, used by an excessive development density, or to treat and dispose of non-domestic wastewater, they can adversely impact surface and ground water quality, as well as public health. Ground water contamination associated with domestic on-site sewage system effluent can involve a number of contaminants, including nitrate, bacteria, viruses, and trace organic chemical compounds.

The Ground Water Advisory Committee goal is to: *Promote on-site sewage treatment and disposal practices that are effective in protecting ground water resources from possible adverse impacts.*

The proposed management strategies are:

- Evaluate the effect of on-site systems on ground water, and to propose residential densities that would keep nitrate concentrations at safe levels. The Management Committee should consider requiring that Wellhead protection programs incorporate Nitrate loading analysis (OS - 1)

- Keep hazardous material from being disposed into on-site sewage disposal systems; King County will inventory facilities served by on-site sewage disposal systems which potentially use, store, or dispose of hazardous materials; educate operators and the general public regarding hazardous materials management; and selectively monitor those facilities that appear to represent a significant risk to ground water quality. (OS - 2A, OS – 2B, OS - 3A, OS - 4)

Pesticides and Fertilizers

Pesticides and fertilizers are in everyday use all around us. The major categories of use are agriculture, home, forestry and rights-of-way maintenance. Pesticides and fertilizers have the potential to contaminate ground water when they are used improperly.

The Ground Water Advisory Committee goal is to: *Prevent ground water contamination from the use of pesticide and fertilizer.*

The proposed management strategies are:

- Provide immediate protection for ground water.

    - King County and cities should use non-chemical vegetation maintenance practices or will use only chemicals which, when used at approved application rates, do not pose a threat to ground water. (PF - 1 C)

- Provide for future ground water protection.

- King County, cities and water purveyors should evaluate the Cooperative Extension Pesticide Reduction Program for effectiveness in protecting ground water, and its applicability to the GWMA. (PF -IB)

- Provide education.

  - King County and cities encourage and support the King Conservation District's development of Farm Plans using Best Management Practices for any agricultural user of pesticide and fertilizer in physically susceptible areas, and water purveyors may contract with the Conservation District to develop Farm Plans in their physically susceptible and recharge areas (PF- 1A).

    - This plan supports the strategies in "Protecting Ground Water: A Strategy for Managing Agricultural Pesticides and Nutrients", April, 1992, and the 1991 Puget Sound Water Quality Authority Plan that helps insure that small farmers and homeowners receive more information about pesticide and fertilizer use. (PF –2A)

  - The King County Department of Natural Resources will review the current educational programs of Soil Conservation Service, Cooperative Extension and others to ensure that the Plan goals and policies are reflected. This will be done as part of the Plan Education Section. (PF – 2B)

Well Construction and Decommissioning

Wells provide a link between an aquifer and the ground surface. Old improperly constructed wells or wells with inadequate seals can serve as a conduit for contaminated surface water to quickly travel to an aquifer. Under State law, any well that is unusable; whose use has been permanently discontinued; or is in such disrepair that its continued use is impractical or is an environmental, safety, or public health hazard, must be decommissioned. An improperly decommissioned well also may serve as a conduit for contaminated ground or surface water.

The Ground Water Advisory Committee Goal is to: *Protect the quality of area ground water by ensuring that proper well construction and decommissioning procedures are followed.*

The proposed management strategies include:

- Provide proper oversight and implementation of the existing regulations. King County and Ecology should develop a local health department program to implement the delegated portion of Ecology's well construction and decommissioning program. (WC - IB)

- Identify and catalogue wells.

  - The King County Council should pursue legislation to require sellers of real property to disclose to buyers the existence of used or unused wells on their property. (WC - 2A)

  - King County and cities should require that applicants establish the location and status of wells present on the property in question during SEPA review and land use permit applications. This information will be provided to Ecology as well. (WC - 2B)

- Ensure proper decommissioning of wells. Provide assistance to those needing to decommission wells, such as funding or alternative methods. (WC - 3 A, 3 B)

- Provide education about well construction and decommissioning. The South King County Ground Water Management Plan Education Program will include information on well identification, well construction, proper well maintenance, contamination sources and well decommissioning. (WC - 4)

Sewers

Older sewers were made from materials such as concrete, brick and clay. Joints were more susceptible to leaking with the use of these materials. Many of these older pipes are still in use today and may be contributing to infiltration, inflow and exfiltration problems. Infiltration is ground water entering sewers, both as runoff during storms, or as base flow from other sources. Inflow refers to direct flows of storm water into sewers through hookups such as roof and footing drains. Infiltration and inflow causes a decrease in ground water, as this water flows through the sewage treatment system into Puget Sound. Exfiltration occurs where sewage discharges from leaking pipes and joints causing ground water contamination.

The Ground Water Advisory Committee goal is: *Prevent the degradation of ground water, which may be caused by waste water leaking from sewers and side sewers, and to prevent the loss of water through infiltration to sewers and side sewers.*

The proposed management strategies are:

- Prevent impacts to ground water:
    - King County, Cities and Sewer utilities should continue, or adopt, regularly scheduled leak-detection-and-repair programs and public education programs to protect ground water aquifers. (SP - IA)
    - King County should amend the Comprehensive Land Use Plans and King County Code 13.24 to require that new sewer piping installed in the most physically susceptible and recharge areas be leakproof (SP - IB)
    - Ecology should consider amendments to sewer construction specifications that will stop the transmission of ground water along pipe alignments. (SP 2)

Solid Waste Landfills

There are environmental impacts associated with solid waste landfills, including leachate and gas production. Leachate is water, or other liquid that has been contaminated by dissolved or suspended materials due to contact with solid waste, or gases from solid waste. Landfills may pose a threat to ground water quality due to leachate production. Ground water that currently is not being used for drinking water also needs to be protected from leachate contamination, as it may become a drinking water source in the future.

The Ground Water Advisory Committee goal is to: *Prevent ground water contamination problems associated with operating solid waste disposal facilities in King County*.

The proposed management strategies are:

- Provide protection through regulations. The Seattle King County Health Department (SKCHD) will prepare amendments to Title 10 to adopt Chapter 173-351 WAC by reference for King County Board of

Health's consideration. (SW-1)

- Remediate existing problems. The SKCHD will evaluate the remediation efforts of King County on abandoned sites and make a report to the Management Committee. (SW 2)

- Provide education. Include information about the relationship between solid waste disposal and ground water in the education program. (SW - 3)

Burial of Human Remains

The Ground Water Advisory Committee concluded that ground water impacts from cemeteries are not a concern in the GWMA.

Sand and Gravel Mining

It is not unusual for productive sand and gravel mines to be located over vulnerable aquifers. Mining activities in these areas can increase ground water vulnerability to contamination both from the extraction process and from site reclamation.

The Ground Water Advisory Committee Goal is to: *Ensure that regulatory programs are adequate to prevent adverse effects upon ground water quality attributed to sand and gravel mining operations.*

The proposed management strategies are:

- Provide future protection:

    - King County and cities should comply with the National Pollutant Discharge Elimination System Permit Program and Ecology's "General Permit" requirements (SG-1)

    - Actively support changes that provide better ground water protection with the SEPA guidance document including best management practices for sand, gravel and rock quarries. (SG-2A, 2B)

    - King County and cities should provide comments to the State Department of Natural Resources on Mine Reclamation Plans proposed within the GWMA. Additionally, King County and other jurisdictions will develop Best Management Practices (BMPs) for mining operations. (SG-3 A)

    - King County and cities should require that reclamation plans for mineral extraction sites include measures to protect ground water quality and quantity. (SG-3B)

Land Application of Biosolids and Effluent

Currently, nearly all the biosolids generated and disposed of in King County are used for silviculture, composting, soil improvement, or agricultural purposes through land application. Potential contaminants in raw biosolids include nitrogen, phosphorous, heavy metals, hydrocarbons, microorganisms, and radionuclides. Based on present technology, properly managed land application of biosolids poses little threat to health or the environment.

Sewage effluent is the liquid that remains after the sewage has been treated. Reuse of effluent is regulated by

the state Water Pollution Control Act, administrated by the Department of Ecology, which also administers the Wastewater Reclamation and Reuse Interim Standards. Currently, reuse of sewage effluent by land application is not widely practiced in King County.

The Ground Water Advisory Committee Goal is to: *Provide assurance that the ground water resources in King County will not be contaminated by the reuse of waste water effluent.*

The proposed management strategy is to provide future protection by encouraging Ecology to include ground water protection in the revised guidelines for reuse of effluent. (BSE - 1)

PROGRAMS TO PROTECT GROUND WATER QUANTITY

The ground water resource reflects the geology and climate of the area. Aquifer and surface water levels are maintained by preserving recharge. State law dictates how water may be appropriated through the water rights program.

The Department of Ecology administers laws dealing with water appropriations and allocations. Allocation to new users must not conflict with existing use. However, the information needed to make allocation decisions may be incomplete. Water users are developing and using innovative techniques to decrease their water use and increase water availability, such as conservation and artificial recharge. Recent interest in maintaining surface water resources has spotlighted the interaction of ground water and surface water. Future ground water resource management must include consideration of this interaction.

The Ground Water Advisory Committee Goal is to: *Manage ground water resources to optimize the preservation and enhancement of the quantity of ground water available to South King County.*

The proposed management strategies are:

- Provide policy direction:
    - King County, cities and other lead agencies should consider impacts on the quantity of aquifer recharge during SEPA checklist review. (WQ - 1)
    - The Ground Water Advisory Committee supports Ecology's Sea Water Intrusion Policy. (WQ - 2B)
- Maintain and enhance natural recharge. King County and cities should consider amending landscaping ordinances and surface water management requirements to encourage conservation and to maintain pre-construction recharge capabilities. (WQ - 4A)
- Provide for information collection and analysis:
    - A ground water data collection management program will be designed and implemented which would enable land and water use decision makers to make water resource decisions based on complete information. (WQ - 2A)
    - Utilities will update their water-right records and report to Ecology, as per

the recommended program in the "Five Year Water Resource Data Management Plan". (WQ - 3)

- Provide for conservation:

  - The Seattle-King County Health Department will propose a revision to regulations for Group B Small Public Water Systems to cover water conservation goals and measures. (WQ - 4B)

  - The Education program will include elements to promote water conservation. (WQ - 5B)

- Explore new techniques for quantity enhancement. Purveyors will be encouraged to investigate artificial recharge programs. (WQ - 6)

IMPLEMENTATION AND FUNDING

Management Committee

The GWAC has recommended that the implementation and management of the Plan be done by a locally based Ground Water Management Committee. The Committee membership includes one representative from: the GWAC, King County, each city in the planning area, each Tribal Nation in the planning area, each Group A water purveyor, and a private citizen. The Management Committee provides oversight to the implementation of the South King County GWMP. Its duties include:

- Review and recommend an annual budget for implementation activities for the South King County GWMP, or any annual revision;

- Monitor the implementation of the South King County GWMP:

- Review annual reports on implementation prepared by the lead agency;

- Determine whether implementation is adequate and whether changes are needed in priorities, monitoring, reporting etc. during the implementation period.

- Act as a forum to consider new or ongoing ground water protection issues of significance to the GWMA;

- Determine whether revisions are needed to the South King County GWMP; and

- Perform tasks as assigned in the South King County GWPM.

Lead Agency

In general, the Management Committee will serve as the "Lead Agency". From time to time the Management Committee may need to assign Plan implementation tasks. This may include staff to perform day-to-day tasks. The Management Committee should delegate an appropriate local government to serve as lead for specific tasks as necessary and consistent with their statutory authority.

Funding Plan

The GWAC recommends that those who will benefit should financially support the GWMP. Users of the ground water resource are water utilities, special purpose districts, water associations, small water systems, individual water systems, industrial, irrigators and (perhaps) surface water utilities. Plan implementers that have service charges or a fee collection system in place should collect their ground water management investments from customers. All fee-collection and participation by water utilities, districts and water associations, shall be on a cooperative, voluntary basis.

Concurrence Process/Plan Adoption/Certification

Public Review

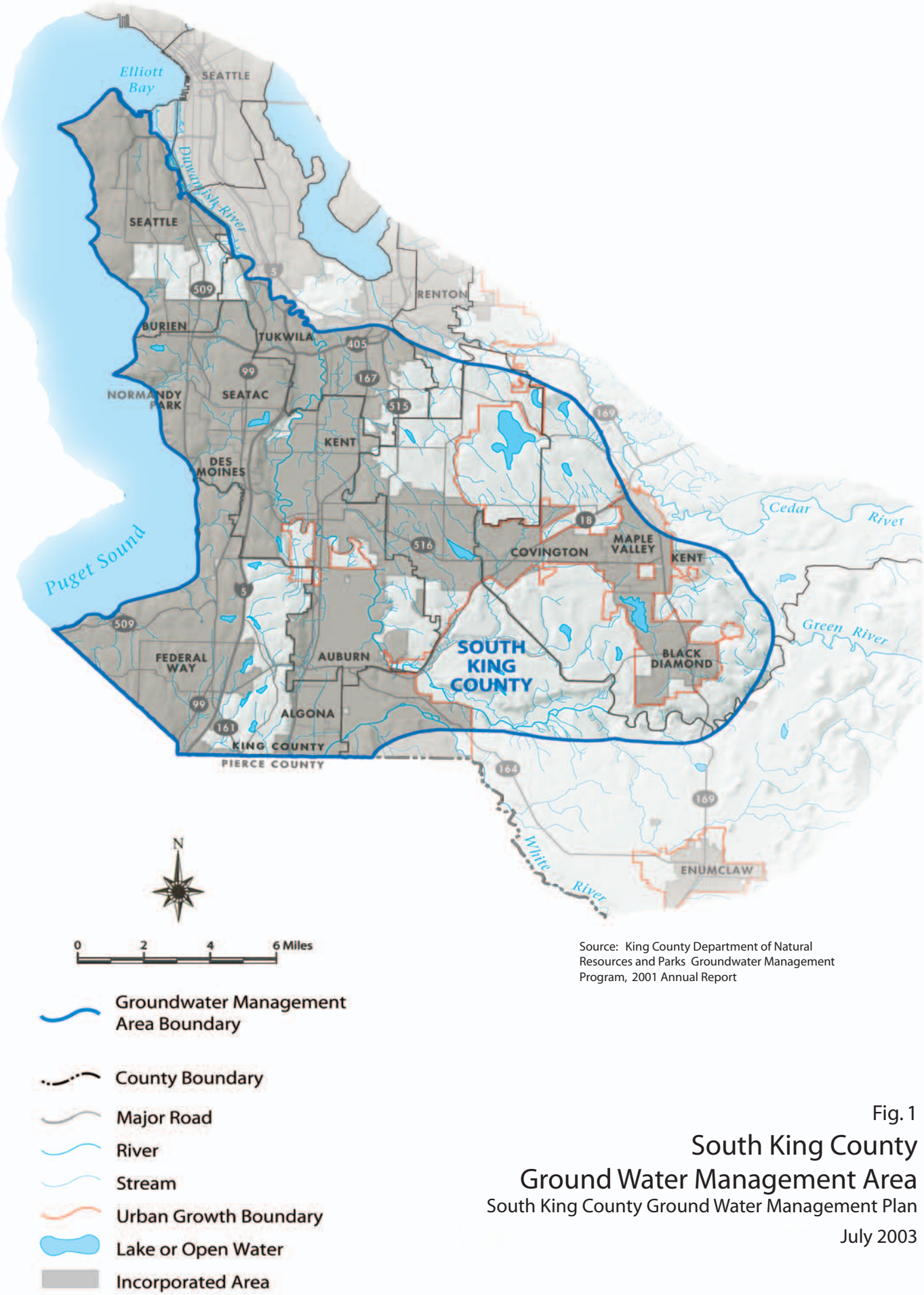
Upon completion, the Draft South King County Ground Water Management Plan is subject to public review. Ecology will hold a local public hearing for comment and review of the plan.

Adoption

Following the hearing, each affected agency and government will have 90 days to evaluate and either concur or disagree with the plan. The Ground Water Advisory Committee will negotiate with nonconcurring agencies and governments to reach agreement. After concurrence, and the Ground Water Advisory Committee finds the plan to be consistent with the intent of Chapter 173-100 WAC, Ecology will certify the plan.

Implementation

Affected agencies and jurisdictions will be responsible for implementing the plan following certification. The implementation process is described in Chapter 3 of the Plan. The Ground Water Advisory Committee has provided a mechanism for modifying the plan to adapt to changing conditions under the supervision of the Management Committee. This committee will advise and oversee ground water management activities that take place under this plan. The committee will also review new issues and programs that emerge during and after Plan preparation. The Management Committee will develop methods to incorporate the new issues and programs into the implementation of the plan.



Source: King County Department of Natural Resources and Parks Groundwater Management Program, 2001 Annual Report

Fig. 1

South King County Ground Water Management Area

South King County Ground Water Management Plan

July 2003

Fig. 2

Areas of Aquifer Susceptibility to Ground Water Contamination

South King County Ground Water Management Plan

July 2003